

Appln. No.10/656,710
Amendment & Response dated June 16, 2005
Reply to Office Action of: April 11, 2005

Amendments to the Drawings:

The attached replacement sheets of drawings include changes to Figs. 6, 8, 10, 17, and 19. These changes are shown in red on the attached annotated marked-up sheets and described in detail in the Remarks section below.

Attachments: Replacement sheets
Annotated sheets showing changes

REMARKS/ARGUMENTS

With the present amendment Applicant has made changes to the specification, drawings and claims. These changes are outlined below along with Applicant's response to the Examiner's objections and rejections.

Changes to the Specification

Concerning the specification, the disclosure has been objected to because of the informality on page 10 at line 16. The terms "value the which" are changed to "the value of which". On page 20 at line 12, the term "Fig. 28" is changed to "Fig. 20A". The preliminary amendment filed January 24, 2005 has been corrected by placing the overbar above the lower case h at page 10, line 21. At page 11, line 1, the term "the" has been deleted. Line 15 has been amended as discussed in connection with drawing changes. At page 13, line 26, the spelling of the term "imaging" has been corrected.

At page 14, line 18, the term "is" has been changed to "are". At line 27, the spelling of the term "non-imaging" has been corrected.

The number "240" has been inserted at line 2 on page 15.

At page 18, line 3, the term "and" has been changed to "as" and the term "photo" has been changed to "photon". At line 33, the spelling of the term "gallium" has been corrected.

At page 19, line 2, the term "bands" has been changed to "band". At line 25, the spelling of the term "inverted" is corrected. Commencing at line 30, the numerical sequence 522-530 has been changed to avoid a double inclusion. At line 34, the spelling of the term "conveyed" is corrected and the terms "...as shown at arrow 526." are added following the number 498.

At page 20, line 12, the number 28 has been changed to "20A".

At page 21, line 11, the terms dichroic component have been replaced with the term "structure". At line 26, the second occasion of the term "with" has been deleted. The overbar in the preliminary amendment with respect to Planck's formula has been corrected.

Changes to the Drawings

It is noted that the number "136" was used in two locations in Fig. 8. The number 136 representing a concentrator is changed to - - 132 - - in keeping with the specification at page 12, line 28. It is noted that the number 180 has been used to designate both an a.c. storage systems block in Fig. 8 and a mirror in Fig. 10. The number should be - - 170 - - in Fig. 8 as described at page 13, line 22. The Examiner has indicated that the number 240 of Fig. 11 is not mentioned in the description. With the instant amendment that number has been inserted after the word "load" at page 15, line 2. The Examiner has indicated that the number 532 in Fig. 19 is not mentioned in the description. That represents a numbering error inasmuch as Figs. 20 and 20A commence with the number 530. Accordingly, the numbers beginning at 522 and ending at 532 now are replaced with the number string 521-526. Appropriate amendments have been made to lines 30-34 of page 19. The Examiner has indicated that the number 78 is not mentioned at page 11 of the specification. The specification exhibits a typographical error here, line 15 at page 11 has been further amended to recite: "Hatched areas 72, 74 and 76 reveal very little effective...". That line was earlier amended to insert the term "device" after the term "photovoltaic". Spelling of the latter term has been corrected with the instant amendment. As indicated above, reference sign 132 has been added to Fig. 8 as it was mentioned at page 12, line 28. Similarly, number 170 has replaced the number 180 in Fig. 8. Further, the Examiner has indicated that the reference sign 200 identified at page 14 was not present in Fig. 10. That correction is made with the instant response.

As an additional correction to the drawings, the ordinate labeling at Figs. 6 and 17 is corrected in keeping with the expression at line 30 of page 10.

Changes to the Claims

With respect to paragraph B of the Office Action concerning double patenting, claim 10 is redundant and has been canceled.

It is noted that claims 1-47 have been rejected under Section 112 of the Patent Statute as being indefinite. As part of this rejection, the Examiner has indicated that the use of the term "substantially" is indefinite because it is subjective. This rejection occurs in connection with claims 1, 7, 17, 19, 21, 22, 29, 39 and 40.

Because of the amendments to the claim program now proffered, the term in question has been essentially eliminated. However, it is submitted that the rejection is inappropriate. The term "substantially" has been accepted and approved by the Patent Tribunals for decades. The most recent decisions of the CAFC approving use of the term are as follows:

	Liquid Dynamics Corp V. Vaughan Co. (CAFC, 1/23/04) 69 USPQ 2d 1595.
Vector	Deering Precision Instruments L.L.C. v. Distribution Systems, Inc. (CAFC 10/17/03) 68 USPQ 2d 1716.
	Cordis Corp. v. Medtronic AVE, Inc. (CAFC 8/12/03) 67 USPQ 2d 1876.
Co.	Playtex Products, Inc. v. Procter & Gamble (CAFC 3/7/05), 73 USPQ 2d 2010.
	Medrad Inc. v. MRI Devices Corp. (CAFC 3/16/05) 74 USPQ 2d 1184.

The treatise by Chism provides an extensive listing of judicial decisions approving the use of the term at 6:18.07[2](3) at note 7. Because of the extensiveness of this listing, a copy of it is appended herewith and made a part hereof. Particularly in a judicial era wherein the Doctrine of Equivalents essentially has been abolished, the use of such terms becomes quite important to the profession.

Claim 2 has been amended in a manner wherein the language objected to has been removed.

The term dichroic in claim 21 has been corrected.

As an initial commentary, the Applicant notes with appreciation the Examiner's indication that claims 11-13, 17, 35-37 and 39 are considered as allowable. The claim program has been amended to generally incorporate the subject matter of these allowed claims. Allowed claim 17 could not be maintained in dependent form inasmuch as it describes a homogenization of light at the primary concentrator. Accordingly, it has been inserted as independent claim 60. However, it now appears that with the instant application and others filed or to be filed, the

inventor has achieved a significant breakthrough in the development of electrical energy from solar radiation at costs competitive with current utility generated power. As a consequence, it is anticipated that the records of patent properties will be subjected to substantial scrutiny in the future. Thus, the references of record are addressed in a greater detail than otherwise may be the case. As part of the record being produced, a declaration under the provisions of 37 CFR 1.132 is forwarded herewith.

The principal features of the invention as now as set forth in the claim program involve the provision of an imaging primary concentrator; the removal of ineffective bandwidths; and the homogenization of light impinging upon the receiving surface of a serially coupled multijunction photovoltaic cell.

Turning now to the rejection applied with respect to the originally presented claim program the following commentary is provided:

It is noted that claims 1, 2, 4-7, 10, 21, 22, 24, 25, 27-30, 46 and 47 have been rejected under §102 of the Patent Statute as being anticipated by House, et al., U. S. Patent No. 4,082,570 (House, et al). Some commentary should be made concerning House, et al. at the outset. Some time ago, the inventor determined that the method and manner of the construction of the photo-diode series is important. This is due to the presence of excessive junction losses and to transistor-like effects when the series is assembled as taught by House, et al. When the inventor first attempted to build concentrating spectrally cooled solar powered generators an approach very similar to that taught by House, et al. was employed. The result was that the results reported by House, et al. were not produced. That was because an uneven distribution of light across a series connected array as described by House, et al. introduces secondary voltage-current relations caused by the transistor-like operation of a stack of PNP junctions as described by House, et al. The result is that the system does not produce consistently usable power at any illumination level. To circumvent these issues, the inventor produced a set of series connected cells that have low junction losses and are electrically isolated from one another so as to produce no transistor-like effects. A secondary non-imaging concentrator was evolved to create a Lambertian distribution of light across the photovoltaic array to reduce uneven illumination which is typical of an imaging concentrator. As noted in the attached declaration, it is the considered opinion of the inventor that House, et al. data produced in the table at column 11 does not reflect a real system. In effect, if

House, et al. had produced the result shown in the tabulation, House, et al. would now be a household word, having achieved a significant breakthrough in the subject matter at hand. The Examiner indicates that radiation is concentrated by lens 28 and that the transmission characteristics of that lens are controlled so that it acts as a band pass filter. As noted in the appended declaration, House, et al. employs a dye with the lens 28 that transmits red and absorbs blue. The energy that's in the blue photons stays in the lens system and heats it up and because of its intimate contact with the photovoltaic cell, the photovoltaic cell itself will be heated up. As a consequence, there is no advantage to the spectral cooling approach described by House, et al. At page 10 of the Office Action, the Examiner indicates that with respect to claims 4, 6, 21 and 27 the concentrating lens 28 is dichroic. That is not the case, the House, et al. lens is colored and absorbs light to create heat as opposed to the reflective heat rejection achieved with dichroic devices. House, et al. describes a filter and not a dichroic system. Additionally at page 10, the Examiner indicates that concentrating lens 28 is a mirror. It is not. It is a dispersive filter provided as a colored lens. At the bottom of page 10 of the Office Action the Examiner discusses the characteristics of a silicon device. The silicon response is quite well known, however, the trick is to get to this bandgap energy with very few losses. With House, et al., the heat generated by the colored filter stays within the system and House, et al. will create dispersive losses and loss of efficiency.

At page 11 of the Office Action, the Examiner holds a position that House, et al. lens 28 provides for uniform intensity with impinging light. It does not. It is an imaging device and images the sun. At the same page, the Examiner indicates that cyanine dye is luminescent. As described in House, et al., it is not. House, et al. describes that the dye functions to absorb light, not re-emit it at a different color. The advantage of utilizing this re-emission approach is that energy otherwise rejected from the system can be re-emitted into the system as useful energy. Note the definition of luminescence provided in the declaration.

It is noted that claims 22, 27, 29-31, 40, 41, and 45 have been rejected under §102 of the Patent Statute as being anticipated by Lewis, et al. Lewis, et al. is considered to be an excellent paper based upon computation. The applicant has discussed the paper with the primary author, Lewis, as indicated in the declaration. With respect to the Examiner's comments that Lewis, et al. teaches, a series-connected array of photovoltaic cells in Fig. 3 at page 404, a misunderstanding is at

hand. The purpose behind Fig. 3 is to carry out a voltage match. In this regard as noted in the declaration the investigator can voltage match, current match or load match. The purpose of this series-connected photocell system is not to reduce total current. It is to add voltages among different bandgap energies. There exists a current/voltage curve for each of these types of photocell. These curves have to match up by current, voltage or load. The latter approach is the most efficient way to do it. Considering the general subject matter, note the peak power tracking identified at block 496 in Fig. 19. This is another of the problems solved on the path to the noted breakthrough. In general, the series-connected system of Lewis, et al. is concerned with the efficiency of the total system as the number of bandgaps increase. Series-connected multijunction devices shouldn't be confused with series coupling of different bandgaps.

Considering the Examiner's commentary at the top of page 12, the instant application teaches the utilization of a Fresnel mirror structure, not a lens concentrator.

With respect to claims 29 and 30, the Examiner took a position that the dichroic beam splitters evolve light at a substantially uniform intensity. That is incorrect as indicated in the annexed declaration. In particular, note at page 402 that Lewis, et al. employs a collimator. That requires imaging and not homogenization.

With respect to claim 31, the Examiner indicated that a prism can provide homogenized light. That is correct but that is not what Lewis, et al. teaches. The prism approach discussed in Lewis, et al. is one of an imaging system not a non-imaging system.

With respect to the Examiner's commentary concerning claims 41 and 45, the apparent failure of bench testing of the Lewis, et al. system (see the declaration) more than likely involved a failure to utilize homogenized light.

It is noted that claims 1-7, 10, 21, 22, 24-30, 46 and 47 have been rejected under §103 of the Patent Statute as being unpatentable over House, et al. The above commentary with respect to that reference should be considered in connection with this rejection, the rejecting language being essentially the same as that employed with respect to anticipation.

It is noted that claims 22, 27, 29-31 and 40-45 have been rejected under §103 of the Patent Statute as being unpatentable over Lewis, et al. In applying this rejection, essentially the same discussion has been advanced as provided in

connection with the anticipation rejection. Accordingly, the above commentary applies with respect to this rejection.

It is noted that claim 23 has been rejected as being unpatentable over Lewis, et al. in view of Swanson, U. S. Patent No. 4,927,770 (Swanson). Swanson is quoted in the background of the instant application and his cell is described in the drawing. Based on knowledge now evolved, the multijunction cells of Swanson should be serially interconnected.

It is noted that claim 32-34 have been rejected as unpatentable over Lewis, et al. in view of Penn, U. S. Patent No. 6,469,241 (Penn), Clark, U. S. Patent No. 4,350,837 (Clark) and Winston, U. S. Patent No. 3,923,381 (Winston).

Lewis, et al. has been discussed above. The system described by Clark is criticized properly by Lewis, et al., at the second column of page 404. See the declaration. Penn is an entirely imaging system and Winston sets forth drawings which are present in his text book on non-imaging objects and are therein fully described as compound parabolic concentrators which are not logarithmically structured. See the declaration.


It is noted that claim 23 has been rejected under §103 of the Patent Statute, the Examiner citing Lewis, et al. in view of Bell, U. S. Patent No. 4,115,149 (Bell). Bell employs a spherical concentrator using a resultant coma image in such a way as to cause uneven illumination. Note additionally, as called for in the claims, Bell uses no coma collector.

The above commentary applies with respect to the remaining objections.

In view of the discussion above, the amended claim program and the correction of typographical errors, it would appear that no further controversy remains in connection with the instant application. Accordingly, issuance of a Notice of Allowance is earnestly solicited.

Respectfully submitted,

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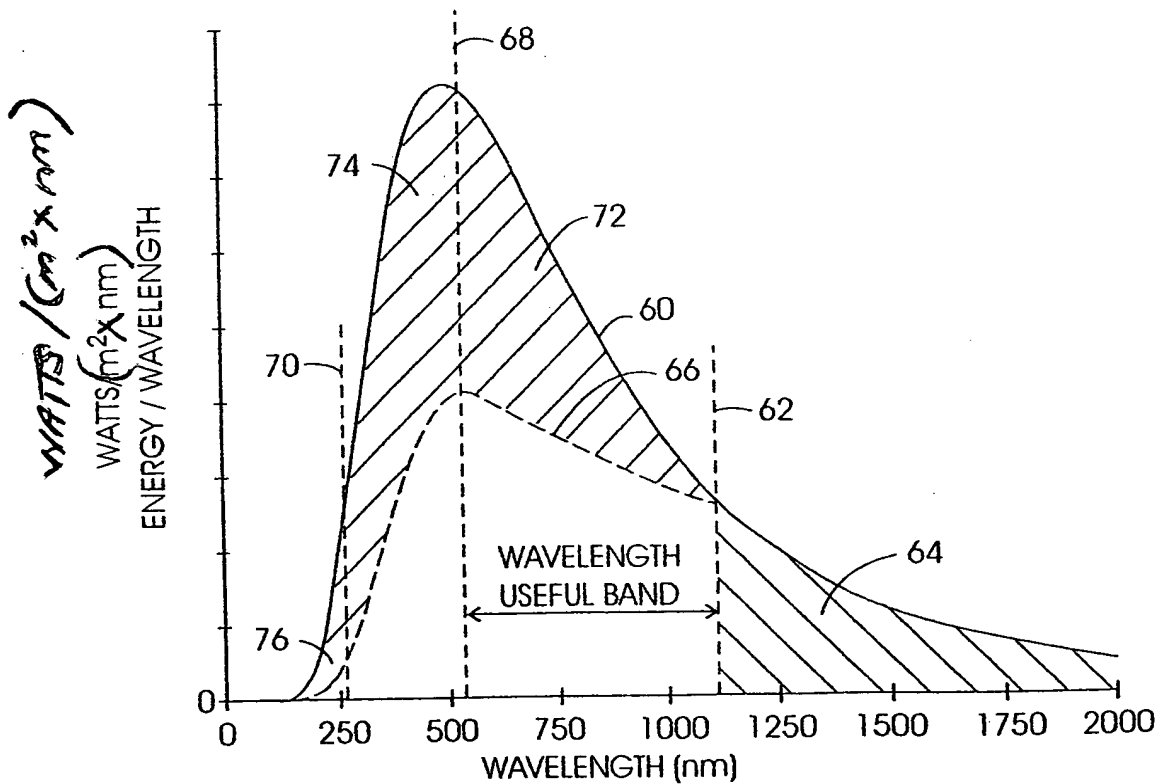
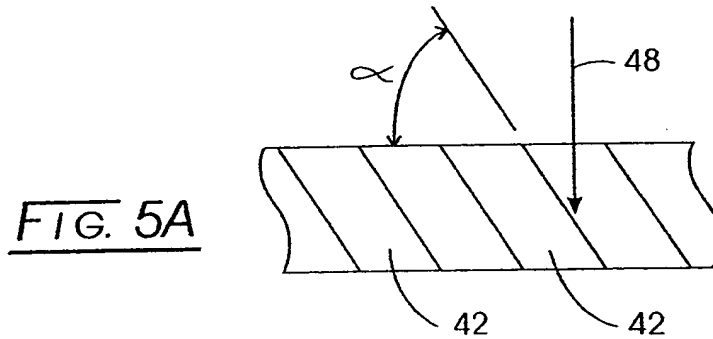
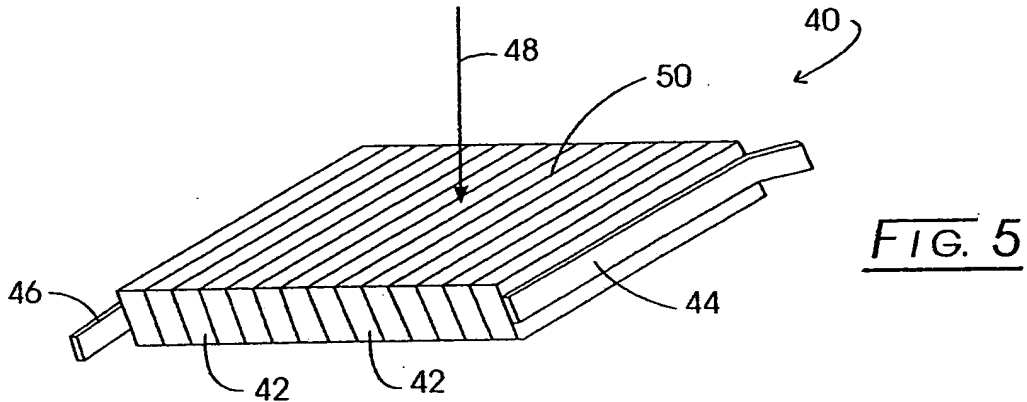
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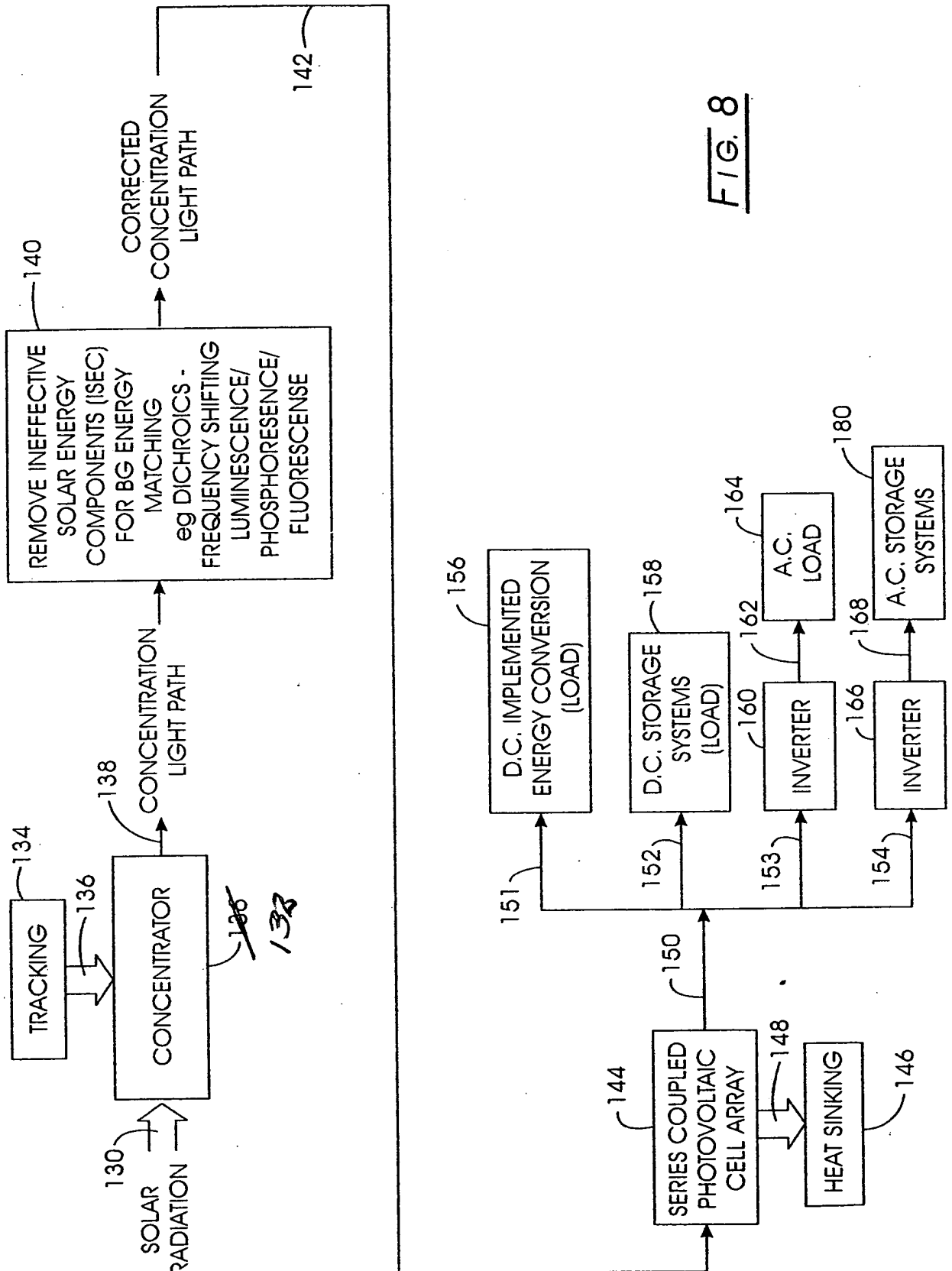
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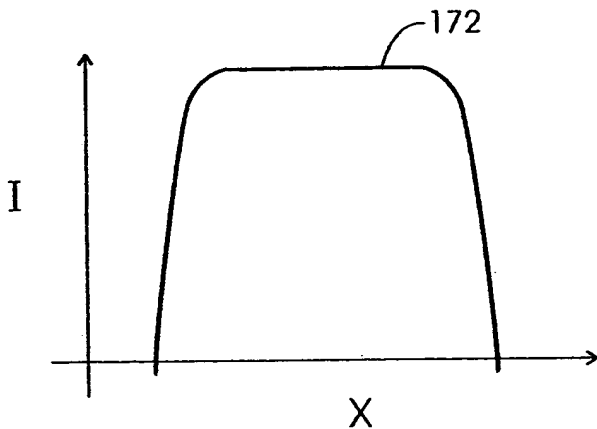


FIG. 9

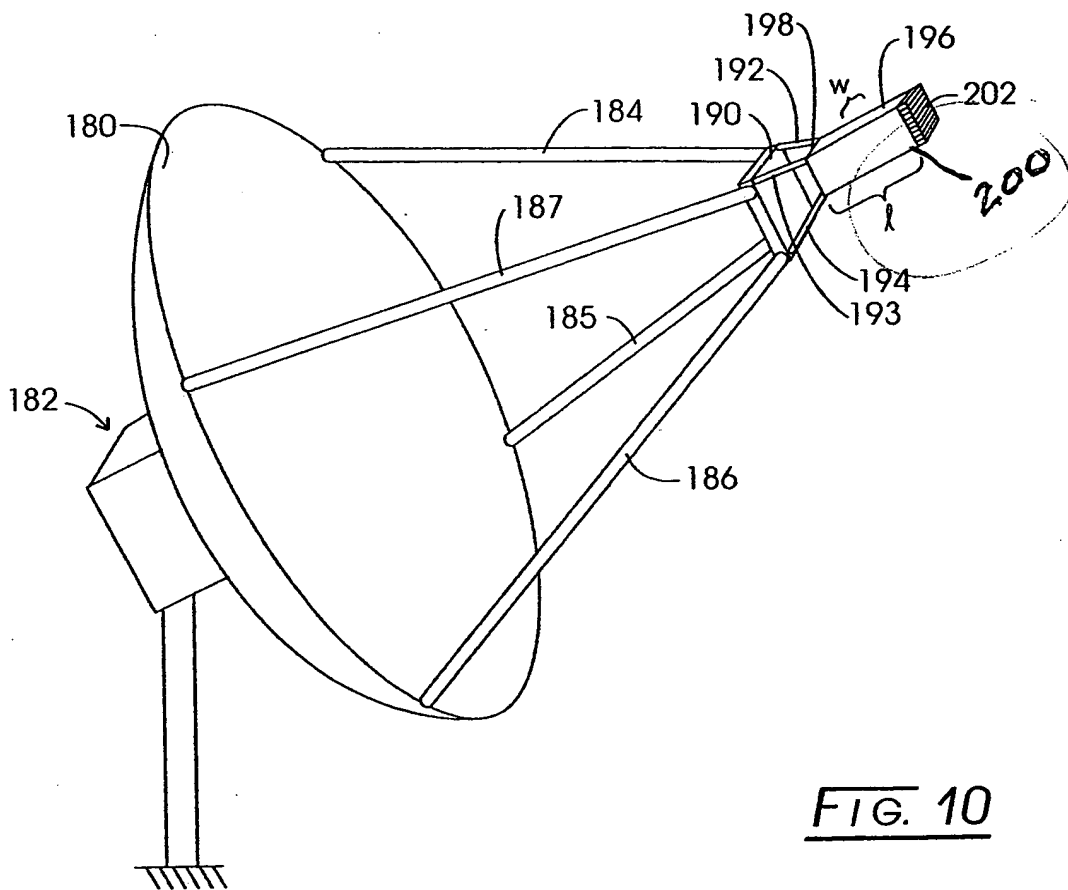


FIG. 10



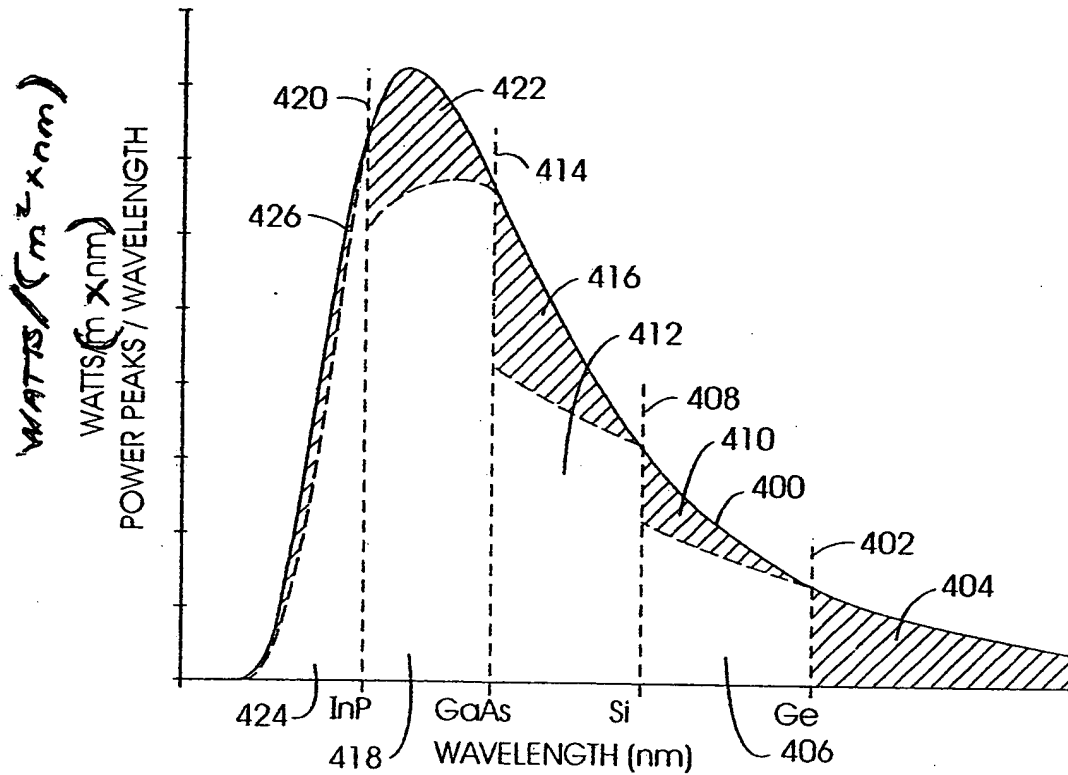


FIG. 17

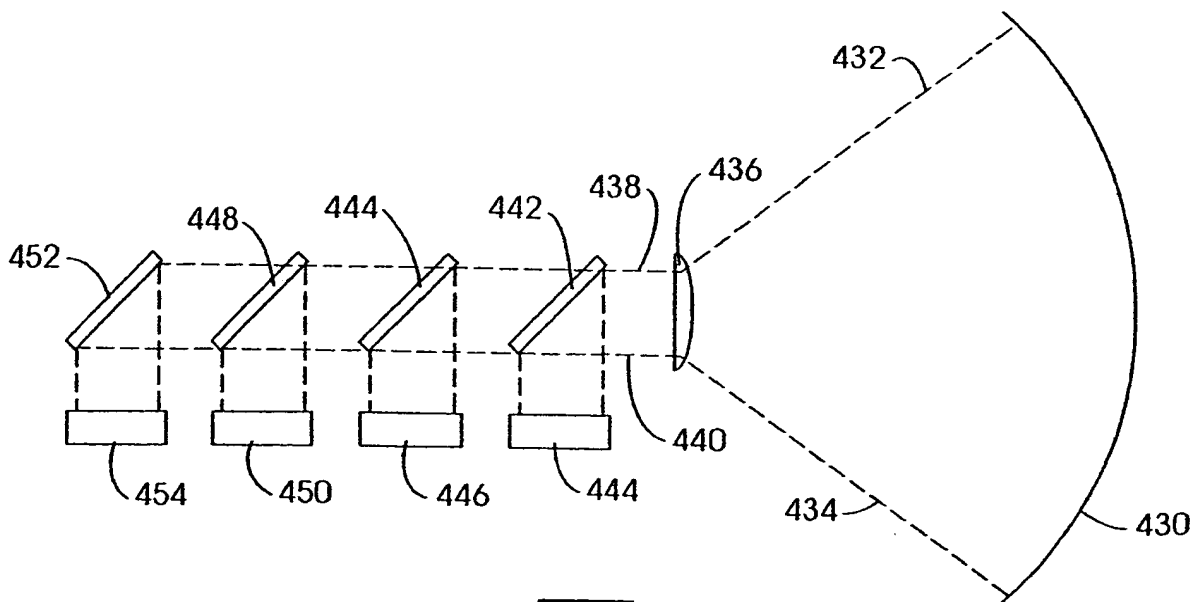


FIG. 18